

## LA-UR-21-28962

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Author(s):	Foley, William Joseph
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# **New Mexico Institute of Mining and Technology**

## **Civil/Environmental Engineering Seminar**

### **Storm Water Conveyance Pipe – Support Failure**

William Foley, P.E., P.M.P.

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10/14/21 1

# General Background

- New Mexico Engineering and Surveying Practice Act (NMSA 61-23-1)

“...it is a matter of public safety, interest and concern that the practices of engineering and surveying merit and receive the confidence of the public ...”

- Why is this important?

# General Background – Engineering Examples

- Tacoma Bridge (11/7/40)



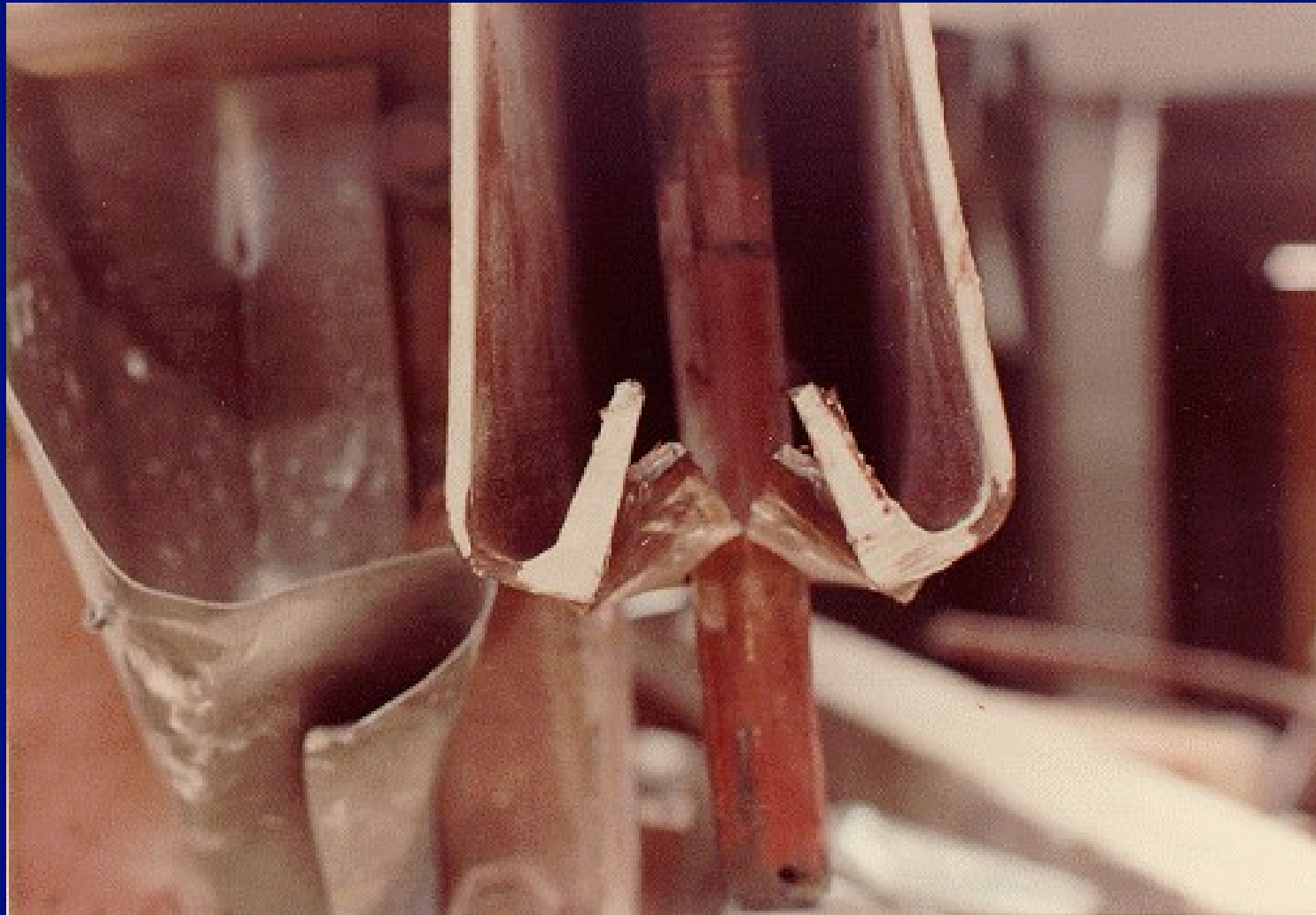
# General Background – Engineering Examples

- Lake Peigneur Salt Mine (11/21/80)



## General Background – Engineering Examples

- Hyatt Regency Skywalk Collapse (7/17/81)



# General Background – Engineering Examples

- Florida International University Pedestrian Bridge (3/15/18)





# General Background – Engineering Examples

– Champlain Towers South (6/24/21)



# General Background – Environmental Examples

- Cuyahoga River



# General Background – Environmental Examples

- Love Canal



# General Background – Environmental Examples

- Bhopal India



# General Background – Environmental Examples

- Deepwater Horizon



# General Background

- Changes in rules
  - Structural for earthquakes
  - Hurricanes and screens
  - Environmental regulations
- What does the future hold?



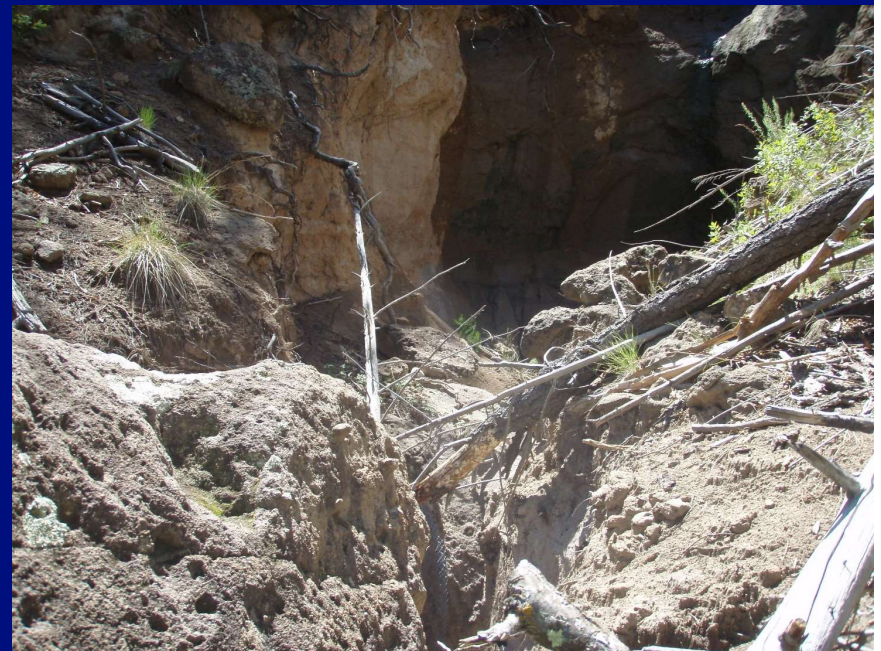
# Background – Storm Water Engineered Structures Project

- Scope developed with input from stakeholders
- Joint decision between DOE/LANL/NMED based on an integrated priority list (IPL)
  - Six large projects – one is the Mid-Mortandad SEP Project
  - Low-impact development (LID) projects
    - Master plan
    - Three LID projects

## Background Mid-Mortandad SEP Project

- Majority of runoff from TA-55 drains NE to a detention pond
- This pond discharges north into Effluent Canyon
- Significant erosion occurring on cliff side below pond outlet
- Goal of project:
  - Transfer flow from pond to canyon bottom through a pipeline
  - Stop erosion, decrease downstream sediment load

Pre-existing conditions

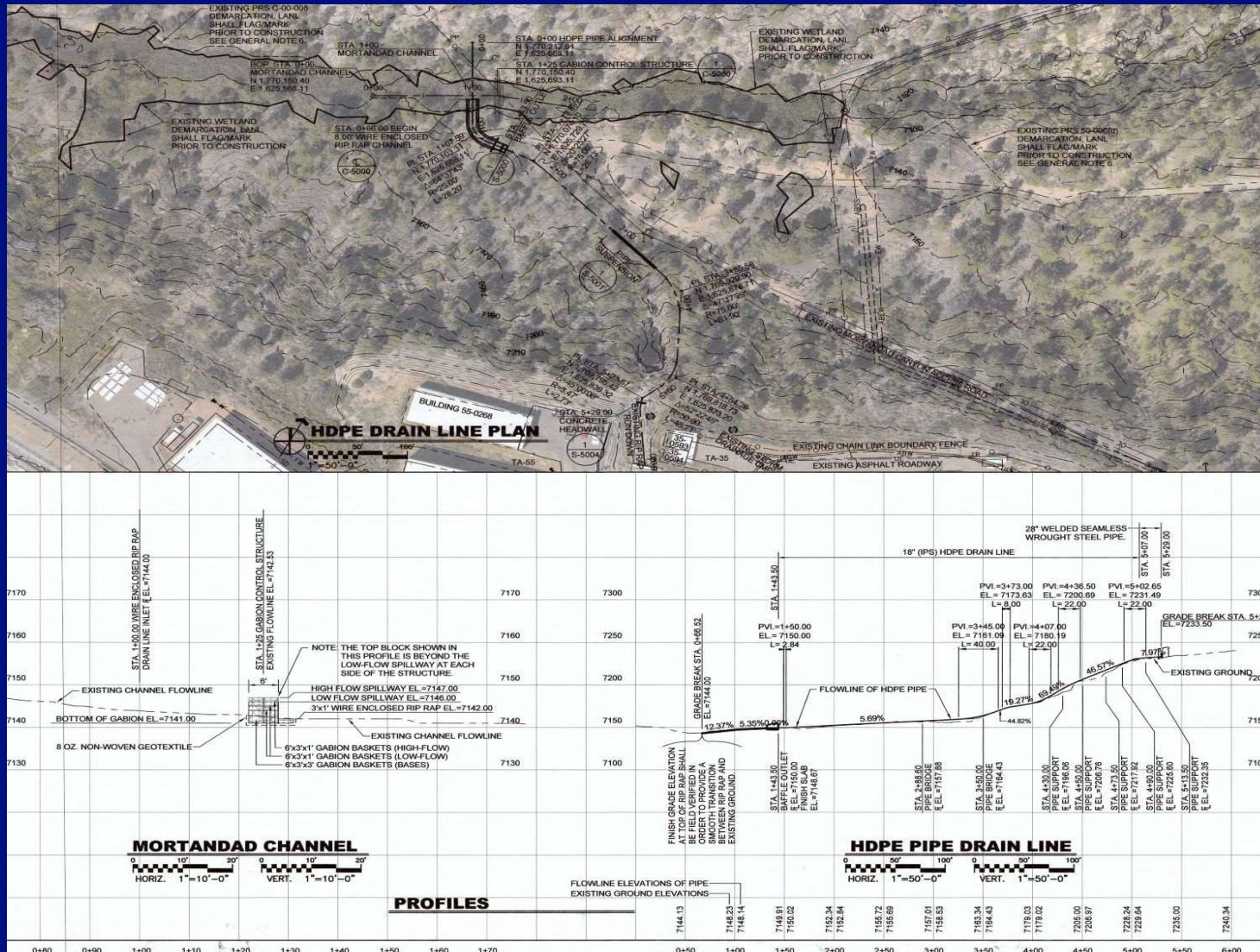




# Project Execution - Overview

- Internal Design - Design Elements
  - Headwall at pond outlet
  - HDPE pipeline
  - Energy dissipation structure at pipe outlet
  - Grade control structure in canyon bottom
  - Wetland enhancement
- External Build

# Project Execution - Design



## Project Execution – Pipe Bridge Background

- One pipeline section spanned a small drainage
- 60 ft span was in 3 sections
- Sections were bolted together at flanges
- Each flange connection had 8 bolts
- Pipeline was suspended from span with hangers



# Project Execution – Prior To Incident





# Project Execution – Prior To Incident





## Project Execution – Prior To Incident





# Project Execution – Support Failure



# Pipeline Support Incident – Day Of Incident

- Sequence of events
  - Pipe rest period
  - Attach pipeline to support structure
  - Allow weight of pipe to be applied to structure
  - 6 of 8 bolts sheared off on one flange
  - Immediate actions taken:
    - Weight removed from support
    - Pipe and support placed in safe condition



## Project Execution – Day Of Incident



# Project Execution – Day Of Incident





# Project Execution – Day Of Incident





# Project Execution – Day Of Incident



## Project Execution – Design Revision Issued

- Element removed
- Replaced with supports used elsewhere on project



# Pipeline Support – Discussion

- Suspect items
- Design flaw
- Surveying issue
- Field changes
- Installation methodology
- ??????



# QUESTIONS